WHAT IS CLAIMED IS:

1. A method of making a BEOL interconnect structure including a porous or dense low k dielectric having low via contact resistance comprising the steps of:

a) forming a porous or dense low k dielectric layer on a substrate;

b) forming single or dual damascene etched openings in said low k dielectric;

c) placing said substrate in a process chamber on a cold chuck at a temperature about -200 °C to about 25 °C;

d) adding to said process chamber a condensable cleaning agent (CCA) to condense a layer of CCA within said etched openings on said substrate; and

e) performing an activation step while the wafer remains cold at a temperature of about -200 °C to about 25 °C.

2. The method of Claim 1, wherein said condensable cleaning agent (CCA) is selected from the group consisting of:

a reducing agent, a molecular source of fluorine, a source of hydrogen and a source of both hydrogen and silicon.

3. The method of Claim 2, wherein said condensable cleaning agent (CCA) is selected from the group consisting of:

metal based reducing agent, metal hydride, mixed metal hydride, metal fluoride, mixed metal fluoride, inorganic fluorine compound, organic fluorine compound and a mixture thereof.

4. The method of Claim 3, wherein said metal fluoride is selected from the group consisting of:

AlF3, TiF4, WF6, TaF6 and a mixture thereof.

5. The method of Claim 3, wherein said inorganic fluorine compound is selected from the group consisting of:

AlF3, TiF4, WF6, TaF6, SF6, XeF2 and a mixture thereof.

6. The method of Claim 3, wherein said organic fluorine compound is selected from the group consisting of:

hexafluoroproplyeneoxide, hexafluorobenzene, fluorinated higher silane and a mixture thereof.

7. The method of Claim 3, wherein said metal based reducing agent is selected from the group consisting of:

LiAlH, AlH3, LiH and a mixture thereof.

8. The method of Claim 1, wherein said activation step comprises:

bombarding with He+ ions or H2+ and H+/H2+, or a mixture of He+ and H+ and H2+.

9. The method of Claim 1, wherein said activation step comprises: irradiating with electron beam or UV radiation.

10. The method of Claim 1, wherein said activation step comprises:

lifting said substrate off said cold chuck with lift pins; and thereafter heating said substrate with heating lamps.

11. The method of Claim 10, wherein said lifted substrate is heated to a temperature about 350 °C to about 400 °C.

12. The method of Claim 11, wherein said lifted substrate is heated to a temperature about 200 °C to about 450 °C.

13. The method of Claim 1, wherein said porous or dense low k dielectric is selected from the group consisting of:

silicon-containing material formed from one or more of Si, C, O, F and H, PE CVD materials having a composition Si, C, O, and H, a fluorosilicate glass (FSG), C doped oxide, F doped oxide and alloys of Si, C, O and H .

14. The method of Claim 1, wherein the porous or dense low k dielectric is selected from the group consisting of:

Black Diamond™, Coral™, Aurora™, Aurora ULK™, Aurora ELK™, BDII™, BDIII™, methylsilsesquioxanes™, siloxanes™, Materials made by JSR under product numbers 5109™, 5117™, 5525™, 5530™, Dendriglass™, Orion™, Trikon™ and a combination thereof.

15. A method of making a BEOL interconnect structure including a porous or dense low k dielectric having low via contact resistance comprising the steps of:

a) forming a porous or dense low k dielectric layer on a substrate;

b) forming single or dual damascene etched openings in said low k dielectric;

c) placing said substrate in a first process chamber on a cold chuck at a temperature about -200 °C to about 25 °C;

d) adding to said first process chamber a condensable cleaning agent (CCA) to condense a layer of CCA within said etched openings on said substrate;

e) moving said substrate to a second process chamber on a cluster tool; and

f) performing an activation step in said second process chamber.

16. The method of Claim 15, wherein said condensable cleaning agent (CCA) is selected from the group consisting of:

a reducing agent, a molecular source of fluorine, a source of hydrogen and a source of both hydrogen and silicon.

17. The method of Claim 16, wherein said condensable cleaning agent (CCA) is selected from the group consisting of:

metal based reducing agent, metal hydride, mixed metal hydride, metal fluoride, mixed metal fluoride, inorganic fluorine compound, organic fluorine compound and a mixture thereof.

18. The method of Claim 17, wherein said metal fluoride is selected from the group consisting of:

AlF3, TiF4, WF6, TaF6 and a mixture thereof.

19. The method of Claim 17, wherein said inorganic fluorine compound is selected from the group consisting of:

AlF3, TiF4, WF6, TaF6, SF6, XeF2 and a mixture thereof.

20. The method of Claim 17, wherein said organic fluorine compound is selected from the group consisting of:

hexafluoroproplyeneoxide, hexafluorobenzene, fluorinated higher silane and a mixture thereof.

21. The method of Claim 17, wherein said metal based reducing agent is selected from the group consisting of:

LiAlH, AlH3, LiH and a mixture thereof.

22. The method of Claim 15, wherein said activation step comprises:

bombarding with He+ ions or H2+ and H+/H2+, or a mixture of He+ and H+ and H2+.

23. The method of Claim 15, wherein said activation step comprises: irradiating with electron beam or UV radiation.

24. The method of Claim 15, wherein said activation step comprises:

lifting said substrate off said cold chuck with lift pins; and thereafter heating said substrate with heating lamps.

25. The method of Claim 24, wherein said lifted substrate is heated to a temperature about 350 °C to about 400 °C.

26. The method of Claim 25, wherein said lifted substrate is heated to a temperature about 200 °C to about 450 °C.

27. The method of Claim 15, wherein said porous or dense low k dielectric is selected from the group consisting of:

silicon-containing material formed from one or more of Si, C, O, F and H, PE CVD materials having a composition Si, C, O, and H, a fluorosilicate glass (FSG), C doped oxide, F doped oxide and alloys of Si, C, O and H .

28. The method of Claim 15, wherein the porous or dense low k dielectric is selected from the group consisting of:

Black Diamond™, Coral™, Aurora™, Aurora ULK™, Aurora ELK™, BDII™, BDIII™, methylsilsesquioxanes™, siloxanes™, Materials made by

JSR under product numbers 5109™, 5117™, 5525™, 5530™, Dendriglass™, Orion™, Trikon™ and a combination thereof.

29. A BEOL interconnect structure including a porous or dense low k dielectric having low via contact resistance prepared by a method comprising the steps of:

a) forming a porous or dense low k dielectric layer on a substrate;

b) forming single or dual damascene etched openings in said low k dielectric;

c) placing said substrate in a process chamber on a cold chuck at a temperature about -200 °C to about 25 °C;

d) adding to said process chamber a condensable cleaning agent (CCA) to condense a layer of CCA within said etched openings on said substrate; and

e) performing an activation step while the wafer remains cold at a temperature of about -200 °C to about 25 °C.

30. The BEOL interconnect structure of Claim 29, further comprising metallic lines and vias.

31. The BEOL interconnect structure of Claim 30, further comprising a liner material lining said metallic lines and vias.

32. The BEOL interconnect structure of Claim 31, wherein said liner material is selected from the group consisting of: TiN, TaN, Ta, WN, W, TaSiN, TiSiN, WCN, Ru and a mixture thereof.

33. The structure of Claim 29, wherein said porous or dense low k dielectric is selected from the group consisting of:

silicon-containing material formed from one or more of Si, C, O, F and H, PE CVD materials having a composition Si, C, O, and H, a fluorosilicate glass (FSG), C doped oxide, F doped oxide and alloys of Si, C, O and H .

34. The structure of Claim 29, wherein the porous or dense low k dielectric is selected from the group consisting of:

Black Diamond™, Coral™, Aurora™, Aurora ULK™, Aurora ELK™, BDII™, BDIII™, methylsilsesquioxanes™, siloxanes™, 5109™, 5117™, 5525™, 5530™, Dendriglass™, Orion™, Trikon™ and a combination thereof.

35. A BEOL interconnect structure including a porous or dense low k dielectric having low via contact resistance prepared by a method comprising the steps of:

a) forming a porous or dense low k dielectric layer on a substrate;

b) forming single or dual damascene etched openings in said low k dielectric;

c) placing said substrate in a first process chamber on a cold chuck at a temperature about -200 °C to about 25 °C;

d) adding to said first process chamber a condensable cleaning agent (CCA) to condense a layer of CCA within said etched openings on said substrate;

e) moving said substrate to a second process chamber on a cluster tool; and

f) performing an activation step in said second process chamber.

36. The BEOL interconnect structure of Claim 35, further comprising metallic lines and vias.

37. The BEOL interconnect structure of Claim 36, further comprising a liner material lining said metallic lines and vias.

38. The BEOL interconnect structure of Claim 35, wherein said liner material is selected from the group consisting of: TiN, TaN, Ta, WN, W, TaSiN, TiSiN, WCN, Ru and a mixture thereof.

39. The structure of Claim 35, wherein said porous or dense low k dielectric is selected from the group consisting of:

silicon-containing material formed from one or more of Si, C, O, F and H, PE CVD materials having a composition Si, C, O, and H, a fluorosilicate glass (FSG), C doped oxide, F doped oxide and alloys of Si, C, O and H .

40. The method of Claim 35, wherein the porous or dense low k dielectric is selected from the group consisting of:

Black Diamond™, Coral™, Aurora™, Aurora ULK™, Aurora ELK™, BDII™, BDIII™, methylsilsesquioxanes™, siloxanes™, Materials made by JSR under product numbers 5109™, 5117™, 5525™, 5530™, Dendriglass™, Orion™, Trikon™ and a combination thereof.